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FOLLOW-UP STUDY OF BRONCHIECTASIS

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INTRODUCTION

The prognosis of bronchiectasis depends on the extent of the original involvement and the degree of superimposed infection and not the bronchial dilatation *per se*. Prior to the antibiotic era, bronchiectasis was described by most writers as a progressive debilitating disease which patients could rarely survive. This concept might be exemplified by Cecil-Loeb's Textbook of Medicine¹⁾ (1951) in which Muschenheim stated that the average duration of life from the time of the onset of symptoms had been generally estimated as ten to fifteen years. Survival for more than twenty years was regarded as rare. But it should be noted that the author stated in his additional comment, that is to say, most published statistics referred to serious patients who were seen in hospital wards.

On the other hand, a comparatively good prognosis of a group of ambulant patients whose symptoms were seemingly not progressive has been reported by a number of investigators^{2),3),4)}.

Recently, the judicious use of antibiotics has improved the prognosis in bronchiectasis.

But little information on the follow-up study of such patients is available, in spite of an interesting problem which remains to be studied that is to say, whether these apparently favorable patients remain as they are for a long time or eventually follow the typical course of bronchiectasis as described in old textbooks.

In other words, it is a matter of great importance to clarify the progression of bronchiectasis. As a matter of fact the present author has been under the impression that bronchiectasis is fully completed when it was demonstrated first on the bronchogram and there is no pregression or spreading thereafter.

The present investigation was undertaken in order to confirm this clinical impression and investigate the prognosis of bronchiectasis in a group of patients

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encountered in ambulant chest clinic service. The study by repeated bronchogram was included in the investigation over the follow-up period.

MATERIALS AND METHODS

All of the patients studied were ambulant clinic patients except one patient who was admitted to the hospital because of worsened respiratory symptoms at the end of the follow-up period.

Twenty cases for the follow-up study were drawn from 107 cases in which definite bronchiectasis were demonstrated on bronchograms between the year 1955 to 1965 at either ambulant clinic of Tuberculosis Research Institute of Kyoto University or Kyoto Branch of Japan Anti-Tuberculosis Association (JATA).

All of the cases studied had more than two bronchograms, initial and final at least, during the follow-up period and chest roentgenograms in addition to the information about patients' symptomatic course were obtained repeatedly when they were seen in ambulant clinics.

All cases were classified according to the type and extent of bronchiectasis which was demonstrated on initial bronchograms. The classification used was as follows:

- Type 1. cylindrical
- 2. saccular
- Extent 1. incipient (slight dilatation of one or two bronchi)
- 2. mild (definite ectasia localized to one or two segments in one lobe)
- 3. moderate (extensive ectasia of one lobe, or ectasia in two lobes not extensive in either)
- 4. extensive (more than moderate in extent)

This classification was suggested in McKim's report²⁾ and employed in the present study because it was estimated by the present author as sufficiently reasonable and practical. As to the type of dilatation all cases were divided into only two categories, because more minute classification was of little practical importance. There was no clear relationship between the shape of dilated bronchi and the clinical symptoms as discussed below.

The period of follow-up study ranged from one to ten years. Of twenty cases for the follow-up study 2 had resection after coming under observation, and 1 was admitted. The treatment given to the remainder was conservative and only occasional. Some of them were asymptomatic and had no treatment.

RESULTS

In Table 1, all of the cases are classified according to the bronchographic

findings. The cases consisted of 48 females and 59 males. Ages at the time of diagnosis ranged from 14 to 73 years. Most cases were moderate or extensive in extent, and cylindrical in type. The cases derived from Tuberculosis Research Institute and JATA are classified separately and presented in Tables 2 and 3, respectively. Twenty cases for the follow-up study are classified in Table 4. The cases

Table 1 Type and extent of bronchial dilatation as demonstrated by initial bronchogram.

Extent	Cylindrical	Saccular	Total
Incipient	10	0	10
Mild	18	3	21
Moderate	37	8	45
Extensive	18	13	31
Total	83	24	107

Table 2 Classification of the cases derived from Tuberculosis Research Institute.

Extent	Cylindrical	Saccular	Total
Incipient	2	0	2
Mild	8	3	11
Moderate	7	0	7
Extensive	4	6	10
Total	21	9	30

Table 3 Classification of the cases derived from Kyoto Branch of Japan Anti-Tuberculosis Association.

Extent	Cylindrical	Saccular	Total
Incipient	8	0	8
Mild	10	0	10
Moderate	30	8	38
Extensive	14	7	21
Total	62	15	77

Table 4 Classification of the follow-up cases.

Extent	Cylindrical	Saccular	Total
Incipient	2	0	2
Mild	2	0	2
Moderate	5	1	6
Extensive	3	7	10
Total	12	8	20

consisted of 9 females and 11 males, and 2 insipient, 2 mild, 4 moderate and 10 extensive cases in respect to the extent of bronchial dilatation. In addition, definite sinusitis was demonstrated in 9 cases as shown in Table 5. In Table 5 are summa-

Table 5. Summary of the follow-up cases.

No	Age	Sex	Sinusitis	Follow-up period (years)	Initial broncho-graphic finding	Symptomatic course	Changes on bronchograms	Physical incapacity
1	18	m	—	1	r. mod. sac.	unchanged	none	none
2	20	fem	+	1.3	r. ext. cyl.	improved	none	none
3	22	m	—	2	l. mod. cyl.	improved after resection		none
4	47	fem	—	2	r. mod. cyl.	unchanged	none	none
5	37	fem	—	2.2	r. inc. cyl.	improved	none	none
6	13	m	+	2.5	r. mil. cyl.	unchanged	none	none
7	22	fem	—	3	r. inc. cyl.	unchanged	none	none
8	15	fem	+	3.5	b. mod. cyl.	unchanged	none	none
9	20	m	—	3.5	b. ext. sac.	unchanged	none	none
10	14	fem	+	4.5	l. mod. cyl.	improved	none	none
11	15	m	—	5	b. ext. sac.	unchanged	none	none
12	17	fem	—	6	r. mod. sac.	unchanged	none	none
13	47	fem	—	6	b. ext. sac.	improved	none	partial
14	47	m	+	7	l. ext. sac.	worse	none	none
15	21	m	+	7	b. ext. sac.	worse	worse	admitted to hospital
16	29	m.	+	8	b. ext. cyl.	unchanged after resection	extension	partial
17	45	m.	—	8.5	l. ext. sac.	worse	none	partial
18	31	m.	+	9	b. ext. sac.	unchanged	none	none
19	15	fem.	+	9	l. ext. cyl.	unchanged	none	none
20	31	m.	—	10	r. mi. lcyl.	unchanged	none	none

Notes: fem. =female

m. =male

age. =at the initial
bronchogram

b. =bilateral

r. =right

l. =left

inc. =incipient

mil. =mild

mod. =moderate

ext. =extensive

cyl. =cylindrical

sac. =saccular

rized the pertinent data concerning twenty patients. It might be seen that most cases were of moderate or extensive extent in this group too; and sexes and broncho-graphic findings were similarly distributed in two groups (Tables 1 and 4).

In Table 6 changes of findings on repeated bronchograms during the follow-up period are presented. Two of the cases which were surgically treated were excluded in this table.

No case showed improvement, in only one patient (Case 15) repeated studies demonstrated an extent of the bronchial dilatation in contiguous areas over period of 7 years. The initial bronchogram of this patient was classified as extensive and

Table 6. The findings on repeated bronchograms during the follow-up period.

	Incipient	Mild	Moderate	Extensive	Total
Improved	0	0	0	0	0
Unchanged	2	2	5	8	17
Worse	0	0	0	1	1

saccular. The remaining 17 cases showed no change. As to two surgical cases, one showed no abnormal finding in remaining lung after left lower lobe resection over the period of 14 months, (Case 3) and the other showed an extension in remaining left upper lobe after left lower lobe resection at the end of 8 year follow-up period (Case 16).

In Table 7 the results of follow-up study on 20 cases with regard to all respiratory symptoms are presented. In 12 cases there had been no change in regard to any respiratory symptoms. Five patients experienced an improvement of symptoms (Cases 2, 3, 5, 10 and 13).

Table 7. The symptomatic course during the follow-up period.

	Incipient	Mild	Moderate	Extensive	Total
Improved	1	0	2	2	5
Unchanged	1	2	4	5	12
Worse	0	0	0	3	3

It may be worth while to note that even the extensive cases were improved. Case 13 in which extensive saccular bronchiectasis was demonstrated in both sides was estimated as a subjectively improved one even though she had been partially incapacitated because of dyspnea on exertion.

In order to determine whether symptoms had improved, increased or remained as they were over the follow-up period, chronic symptoms such as cough and sputum, red blood cell sedimentation rate and chest roentgenograms which had been recorded on clinical protocols were reviewed and the patients' opinion on their symptomatic course was taken into consideration at the final examination.

In only 3 patients whose ectasia were extensive symptoms had become worse. An increase in amount of purulent sputum was complained of by one case (Case 14). One other case had felt a little more short-winded (Case 17). The third case was admitted to the hospital because of high fever, increased amount of sputum and repeated hemoptysis at the end of follow-up period. In only this patient an extension of bronchiectasia was demonstrated on repeated bronchograms. (Case 15).

In Table 8 the status of physical incapacity existing in the cases studied at the

Table 8. Phphysical incapacity at the end of the follow-up period.

Degree of physical incapacity		Extent				Total
		Incipient	Mild	Moderate	Extensive	
None	With no symptom	1	2	3	0	6
	With cough suputum etc.	1	0	3	6	10
Partial		0	0	0	3	3
Admitted to hospital		0	0	0	1	1

end of follow-up period are summarized. Patients were considered to be physically incapacitated if they were obliged to limit their daily activity because of any respiratory symptoms.

Sixteen out of twenty, that is to say 80 percent of the cases studied had no physical incapacity. Six cases in this group were asymptomatic and ten cases had been working steadily even though they had raised a small amount of sputum in the morning or experienced hemospotum once or twice a year. In some cases cough and sputa were noted only when they caught cold. It is worth while to note that the extent of bronchiectasis seemed to have little influence on the patient's liability to physical incapacity.

Because of dyspnea on exertion or purulent sputum physical activity was partially limited in three cases (Cases 13, 16 and 17) whose ectasia were extensive.

CASE REPORTS

1. Case 8. A case of Kartagener's triad. A fifteen-year-old girl was found to have bilateral cylindrical bronchiectasis associated with *situs inversus* and severe paranasal sinusitis (1963). She had chronic cough for a long time and raised small amount of purulent sputum when she caught cold which occurred frequently. She had been treated occasionally for sinusitis. Her respiratory symptoms did not improve but she appeared to be in good health during the follow-up period without any other complication. Values of red blood cell sedimentation rate had ranged within the normal range. Bronchographic examination was repeated in 1966, and it was estimated that there was no change. (Fig. 1)
2. Case 11. This patient, who had suffered from severe measles in his infancy, was a fifteen-year-old middle school boy at the time of initial bronchogram (1961) on which bilateral extensive bronchiectasis, mainly saccular, was demonstrated. Unfortunately, this patient had been treated with anti-tuberculosis drugs for a

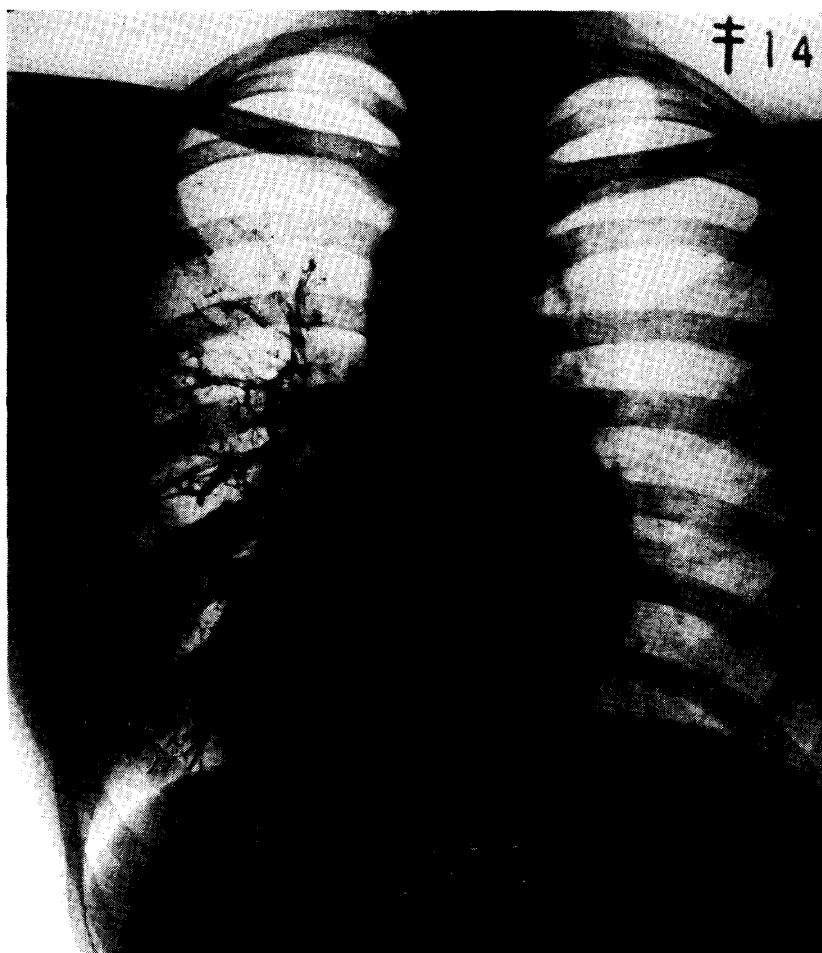


Fig. 1. Bronchogram of Feb. 1966.

couple of years by a family doctor, because of mild chronic cough and an abnormality on chest roentgenogram. Amount of sputa increased only when the patient caught cold.

After confirming the diagnosis the patient came under observation. During the follow-up period chest roentgenograms were obtained regularly twice a year, and bronchographic studies were undertaken at intervals.

Chest roentgenograms showed no change, and it was concluded that no change had occurred in the type or extent of the bronchial dilatation over 5 years of follow-up study (Fig. 2 and 3).

The patient has been studying steadily in high school with no significant change in his condition.

3. Case 15. This patient was admitted to the Hospital of Tuberculosis Research Institute because of purulent sputum, chronic cough, general malaise and emaciation which had not been ameliorated in spite of prolonged chemotherapy for pulmonary tuberculosis for over two years.



Fig. 2. Bronchogram of Feb. 1961.

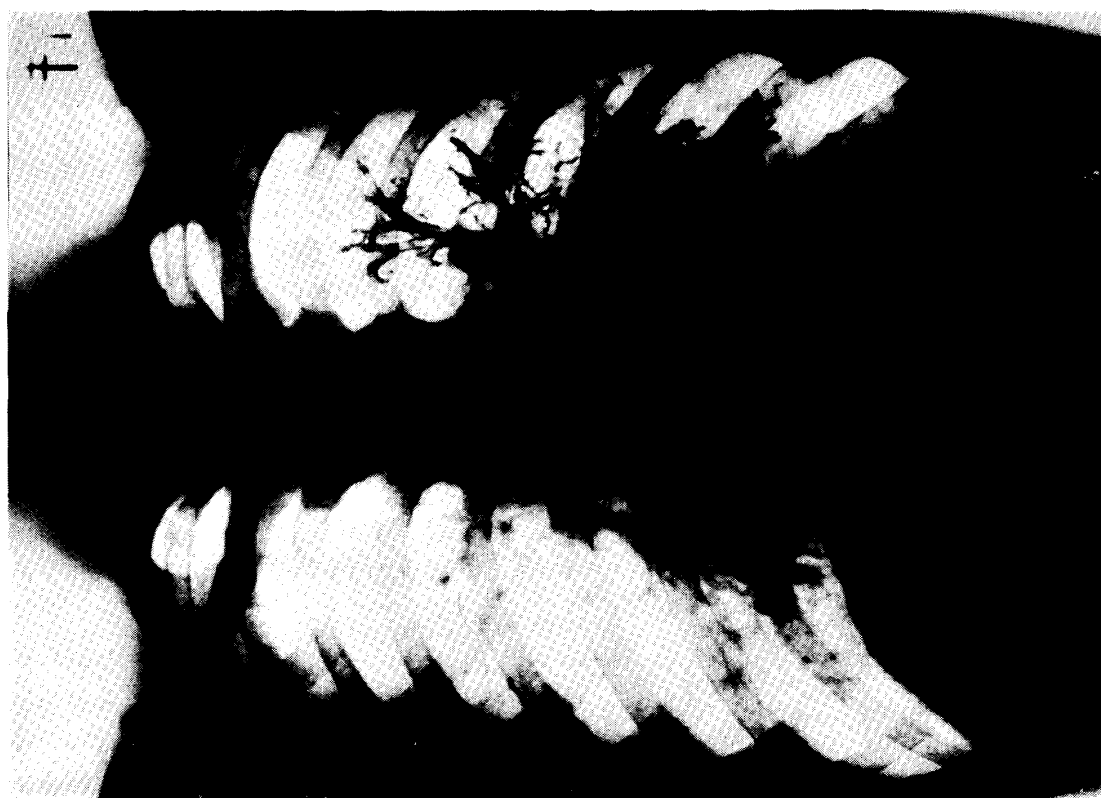


Fig. 3. Bronchogram of Apr. 1966.



Fig. 4. Bronchogram of Aug. 1959.

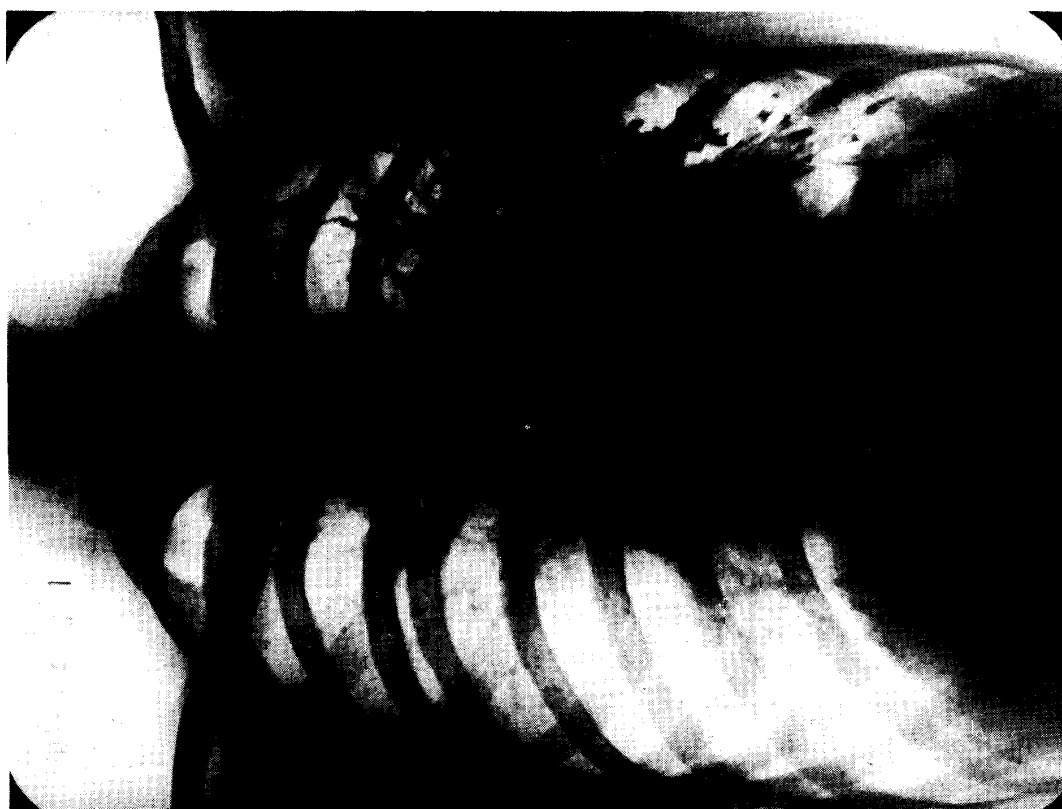


Fig. 5. Bronchogram of May 1966.

At that time, bronchiectasis was demonstrated when the patient was 23 years of age (1958), bronchogram revealing extensive saccular dilatation in both lungs. His symptoms improved rapidly owing to the antibiotics therapy and the patient was discharged "improved" six months later.

His respiratory and constitutional symptoms, however, had progressed gradually after leaving the hospital. Tubercle bacilli had never been discovered in sputa on repeated examinations.

In April 1966, the patient was admitted again to Tuberculosis Research Institute. Complaints were of recurrent high fever and chronic cough productive of 60 cc of purulent sputa mixed with blood. Bronchographic examination was repeated in May 1966, and an extension of dilatation was demonstrated. (Fig. 4 and 5)

Serial roentgenograms revealed evidence of gradually increasing fibrosis.

The patient had never been at work because of troublesome symptoms. The progression of the disease in this case might have been aggravated by the complication of tuberculosis, being tubercle bacilli positive on culture media found first in May 1966.

DISCUSSION

The course of the disease is extremely variable. Extensive bronchial dilatation may exist without symptoms for years only to become occasionally symptomatic. A number of cases are suspected of the disease on chest roentgenograms which are obtained periodically in order to detect early pulmonary tuberculosis, and a dilatation of several or more of the bronchi in the lung are revealed first by bronchographic examination.

This fact is exemplified clearly by the materials studied in this report, in which there were two groups of patients derived from different chest ambulant clinics, that is 30 cases from Tuberculosis Research Institute and 77 cases from Kyoto Branch of JATA.

It might be supposed that comparatively severe cases are found in the former which is well accommodated with wards as the chest department of the university clinic.

On the other hand, mass examination for detecting pulmonary tuberculosis among civilians especially who are working in the business field has been achieved by JATA which has no accommodation available for hospitalization.

As shown in Tables 2 and 3 there was no clear difference in the distribution in respect to the extent and the shape of bronchiectasis between two groups of patients,

63.3 per cent (17 of 30) of the former group and 76.6 per cent (59 of 77) of the latter were classified as of moderate or extensive extent. Furthermore, 77 cases which were drawn from the JATA were discovered out of 152 cases which had been suspected of bronchiectasis only by reason of some abnormality found on chest roentgenogram.

This is some evidence for believing that cases discovered in ambulant clinics such as those who were seen in JATA may occur in a general population, and the patients are working with or without only mild symptoms and slight roentgenographic abnormalities.

Bronchographic examination has become more common practice recently in diagnosing chest diseases, and it might be supposed that this practice has demonstrated the presence of bronchiectasis in many apparently healthy people.

In Harrison's Principles of Internal Medicine⁵⁾ Knowles states that it is of utmost importance to note that bronchiectasis is an acquired disease that is not, except in rare instances, progressive. It does not commonly spread and is ordinarily maximal when first seen.

Discussion on the etiology of bronchiectasis is beyond the purpose of the present paper, but the majority of cases included in the present study correspond to this description.

McKim²⁾ observed 49 ambulant clinic patients for a period of 9 to 20 years, and in 41 surviving patients there was clinical evidence of progression in only 3 instances. More than half of the group experienced an amelioration of symptoms. Physical incapacity was absent in 75 percent of patients. The complications usually expected in association with bronchiectasis were relatively rare.

Bronchographic examination was repeated in this study too, but only in 8 cases. Six repeated studies showed no change, in two patients repeated studies demonstrated an extension of the bronchial dilatation in contiguous areas over a period of two and eighteen years. The writer confirmed the existence of benign bronchiectasis which has little resemblance to the disease described in old medical text books, and concluded that the progression, and consequently the most desirable treatment can be decided only on the basis of thorough clinical study, often requiring a period of judicious observations.

Hinshaw and Garland⁶⁾ state that the crucial question is whether bronchiectasis localized to a single segment or lobe might progress and involve other segments or lobes if untreated, and it is difficult to answer this question precisely. It was suggested that untreated bronchiectasis was likely to become more severe, and might extend to previously uninvolved segments, especially in persons with the

disease who suffer repeated attacks of chills and fever, with sputum retention and abscess formation.

Awataguchi⁷⁾ followed 114 cases of unilateral bronchiectasis for 3 months to ten years, although the study by bronchographic examination was not undertaken. The author stated that 95 cases (83.3 percent) had been working steadily without any symptoms (46 cases, 40 percent) or with some respiratory symptoms (49 cases, 43 percent), and that there was no propagation of the disease if the patients were treated properly when their symptoms increased, but there might be an extension of the bronchial dilatation in contiguous area if the patient were untreated.

Wynn-Williams³⁾ followed 155 adult cases for 5 to 10 years who had not had resection and survived under conservative treatment. In 13 of them, clinical findings improved, less sputum being judged as improvement. Symptoms in 7 patients had become worse. Estimation of a downhill trend was based on increased symptoms of dyspnea on exertion, toxemia or sputum. The remainder were unchanged. Of the 37 children who survived the period, 16 had improved, and 2 deteriorated while under observation. The remainder were unchanged. Repeated bronchographic study was also not undertaken in this report.

Because of the frequent association, a causal relationship of upper respiratory infection, especially paranasal sinusitis, to bronchiectasis has been widely assumed, but there has been no convincing evidence to clarify the etiologic role between the diseases.

In the present study of 20 cases, definite sinusitis was demonstrated in 9 cases in which almost all ectasia were extensive.

It has been generally assumed that saccular bronchiectasis is a more serious disease than the tubular form.

Three cases which were estimated as worse in symptomatic course in the present study had saccular ectasia, but of the remainder with saccular ectasia 5 remained unchanged and 1 improved.

In Case 8 severe paranasal sinusitis and *situs inversus* were demonstrated in association with bronchiectasis. This was a case of Kartagener's triad⁸⁾.

SUMMARY

A follow-up study of bronchiectasis was reported in which twenty ambulant clinic patients were observed for a period of one to ten years, and bronchographic examination was repeated in all cases during the follow-up period. The cases were drawn from 107 patients with bronchiectasis which was demonstrated on bronchogram.

Five cases experienced an amelioration of symptoms, and in 12 cases there had been no symptomatic change. Symptoms had become a little more severe in only 3 cases.

Physical incapacity due to some respiratory symptoms was absent in 16 cases, 80 percent of the cases.

Excluding two surgical cases, extension of bronchial dilatation was demonstrated in only one case which was the most severe case among the follow-up cases.

There was little correlation between the severity of symptoms and the extent or shape of bronchial dilatation.

It might be concluded that the prognosis of bronchiectasis studied in this report was fairly good, and that the progression of the disease occurred rarely.

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